

A DEGRADATION STUDY OF
DISLodgeABLE METHAMIDOPHOS RESIDUE
ON TOMATO FOLIAGE IN SAN DIEGO COUNTY

By

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SUMMARY

During August of 1983, a degradation study of dislodgeable methamidophos (Monitor) residue on tomato foliage was conducted in San Diego County. The safety interval for methamidophos on tomatoes is one day. Samples were collected for seven consecutive days beginning 24 hours after the application. Analytical results ranged from a high of 0.015 ug/cm² at the first sampling (24 hours after the application) to a low of 0.002 ug/cm² seven days after the application. A leaf surface residue of 0.66 ug/cm² has been estimated as a safe level for methamidophos. This level was not exceeded during the study.

INTRODUCTION

In June 1971, the California Department of Food and Agriculture established reentry intervals for specific crop/pesticide combinations. A reentry interval is the time period that must elapse between the application of a pesticide and the entry of unprotected workers into the treated area. This waiting period was instituted to allow sufficient time for toxic materials to environmentally degrade to a low toxicity residue level. The estimated safe level for methamidophos has been calculated to be 0.10 ug/cm^2 (Knaak, 1984). The adequacy of these reentry intervals has not been thoroughly evaluated since their introduction. In 1983 several studies were initiated to validate existing reentry intervals. This study was conducted to monitor the foliar decay rate of methamidophos.

Methamidophos (Monitor) is a systemic organophosphate insecticide effective against a wide variety of pests. It has an oral LD_{50} (rat) of 7.5 mg/kg and a dermal LD_{50} (rabbit) of 50 mg/kg (NIOSH, 1983). This study was conducted to monitor the degradation of methamidophos in field conditions, providing necessary information for evaluation the safety interval.

METHODS

With assistance from the San Diego County Agricultural Commissioner's staff, a local tomato grower was contacted and asked to cooperate in this study. One tomato field was monitored for seven consecutive days after the methamidophos application. The field was located near the Pacific Ocean approximately midway between San Diego and Los Angeles, near Camp Pendleton Marine Base. The application rate was one quart (1.0 lb. a.i.) of Monitor/acre applied in a tank mix of 50 gallons of water/acre.

The tomato field was divided into three areas. One row from each area was selected and identified with markers for daily sampling. Twenty-five plants in each row were chosen for sampling. Three replicate samples were taken from each plant each day. Each composite sample consisted of 75 leaf punches, one leaf punch from each of the 75 plants. These samples were collected using a 2.54 cm disk leaf punch which was cleaned with alcohol between samples. The first sample was taken approximately 24 hours after the application, then again every 24 hours, for a total of seven sampling days.

The leaf punch sample bottles were sealed with aluminum foil, capped, and stored on ice for the duration of the study. When the six days of sampling were completed, the samples were shipped to Chemistry Laboratory Services in Sacramento for analysis. Dislodgeable residues were removed by mechanically shaking the leaf disks with a water-surfactant solution. The aqueous wash was extracted with ethyl acetate, dried with anhydrous sodium sulfate, and concentrated or diluted as necessary. The analysis was by gas chromatography with a method sensitivity of 0.0005 ug/cm^2 .

Weather data for the time period of this study was obtained from the Marine Corp Base. Air pollutant data was obtained from the nearest California Air Resources Board monitoring station at Costa Mesa-Placentia, approximately 25 miles northwest of the study site.

RESULTS

The analytical results for each composite sample as well as a calculated average for each day are presented in Table 1. Table 2 shows the maximum and minimum air temperatures as well as the average dew points and wind speeds for the period during which the study was conducted. Table 3 shows the average daily concentrations of selected air pollutants monitored at a nearby ARB station in the south coast air basin for the same period. Figure 1 shows the data from Table 1 in chart form.

DISCUSSION

The sample results ranged from a high of .015 ug/cm², taken 24 hours after the application to a low of .002 ug/cm², taken seven days after the application. All samples collected were above the minimum detectable level of .0005 ug/cm². The application rate used during this study was the maximum allowable rate recommended by the label. No sample exceeded the estimated safe level of 0.66 ug/cm². Existing reentry intervals were established upon the degradation of maximum label application rates. To minimize cost and pest resistance to the material growers usually do not apply maximum rates. Several factors such as, ambient and radiant temperature, humidity, and solar radiation may influence the degradation of pesticides. These factors were not within the scope of this study to measure and were not taken into account.

TABLE 1

<u>Date</u>		<u>Days After Application</u>	<u>ug/cm²</u>			<u>Average</u>
			<u>Replicate 1</u>	<u>Replicate 2</u>	<u>Replicate 3</u>	
Aug.	29	1	.012	.013	.015	.013
	30	2	.016	.010	.013	.013
	31	3	.007	.007	.006	.007
Sept.	1	4	.005	.006	.007	.006
	2	5	.010	.007	.014	.010
	3	6	.003	.003	.003	.003
	4	7	.002	.002	.002	.002

NOTE: The minimum detectable level for these samples were 0.0005 ug/cm².

TABLE 2

Temperature °F				
<u>Date</u>	<u>Maximum</u>	<u>Minimum</u>	Average	Average
			<u>Dew Point</u>	<u>Wind Velocity</u>
				<u>Knots</u>
Aug. 27	79	66	63	Calm
29	89	59	63	SW8
30	86	62	67	SW9
31	87	62	66	SW9

TABLE 3

Average Concentrations of Selected
Air Pollutants in the South Coast Air Basin
Reported by the Costa Mesa-Placentia Station

Date	Carbon Monoxide CO/ppm	Sulfur Dioxide SO ₂ /ppb	Nitric Oxide ppb	Nitrogen Dioxide ppb	Oxides of Nitrogen ppb	Ozone ppb
Aug. 28	1.2	2	5	33	39	44
29	1.1	4	8	34	42	35
30	0.6	0	10	26	36	24
31	0.7	3	13	22	36	24
Sept. 1	1.0	6	23	26	49	10
2	1.0	4	11	25	36	23
3	0.6	1	1	20	21	30
4	0.3	1	0	10	10	42

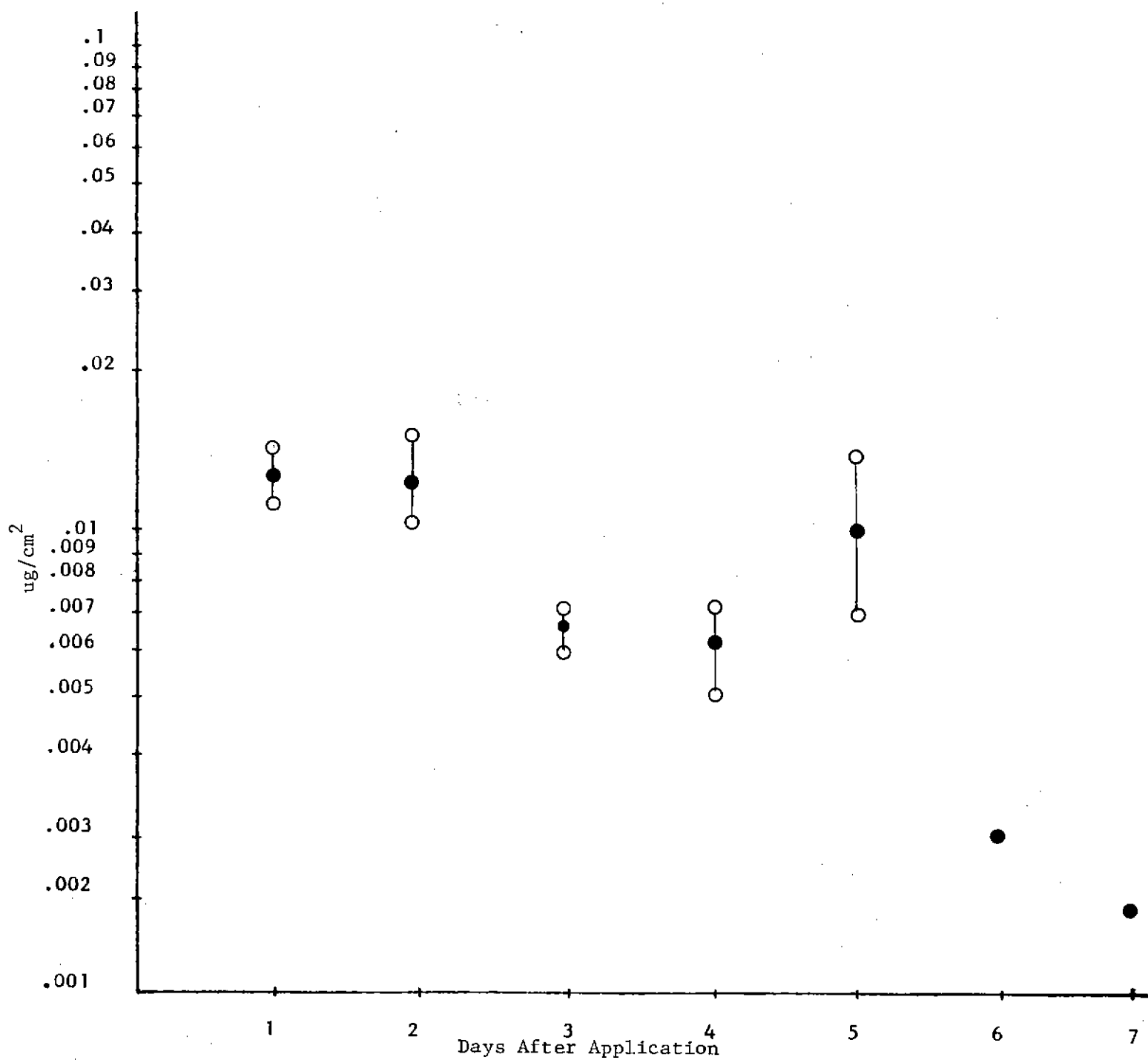


Figure 1. Analytical results of methamidophos concentrations plotted against time.

REFERENCES

1. NIOSH. 1983. 1983 Registry of Toxic Effects of Chemical Substances. Vol. 3, p. 127.
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